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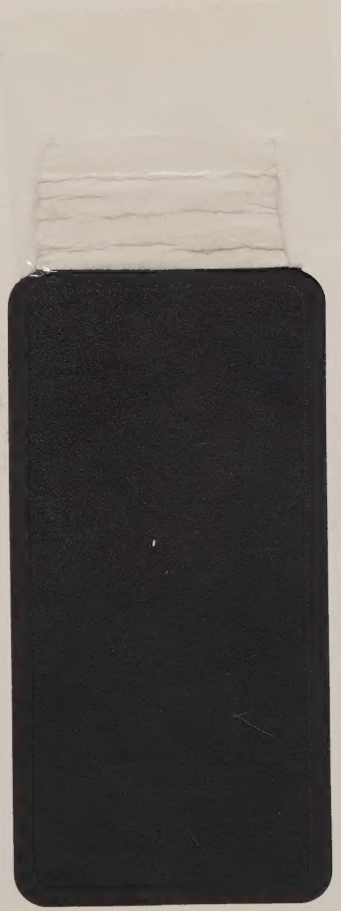

MODEL 5209

PORTABLE DC HYPOT

0-1.5KV DC

SAFETY

THE TEST OPERATOR MUST FOLLOW ALL ACCEPTED SAFETY PRACTICES, PROCEED WITH CAUTION, AND DO ALL IN HIS POWER TO ASSURE A SAFE TEST.

BECAUSE OF THE INHERENT DANGERS IN ANY HIGH VOLTAGE WORK, SPECIAL CARE MUST BE TAKEN TO SAFEGUARD PERSONNEL DURING ANY TESTING OR FAULT FINDING.

GENERAL

REGARDLESS OF THE TYPE TEST TO BE MADE OR FAULT TO BE FOUND, CERTAIN PRELIMINARY STEPS SHOULD PRECEDE THE ACTUAL TEST. FIRST, OPEN ALL SWITCHES AND BREAKERS TO DE-ENERGIZE THE CABLE OR EQUIPMENT AND ISOLATE THE ITEM. USING A HOT STICK AND RUBBER GLOVES, GROUND ALL SECTIONS OF THE TEST ITEM, TO INSURE THAT IT IS NOT CHARGED.

CAREFUL ADVANCE PLANNING IS ESSENTIAL TO A PROPER AND SAFE TEST. PROPER TEST EQUIPMENT, GROUND LEADS, HIGH VOLTAGE CABLES, HOT STICK RUBBER GLOVES AND ANY OTHER SPECIAL TOOLS SHOULD BE ASSEMBLED AT THE TEST SITE.

THE EQUIPMENT TO BE TESTED SHOULD BE DE-ENERGIZED, *PROPERLY GROUNDED AND DISCONNECTED. CABLES TO BE TESTED SHOULD BE DE-ENERGIZED, *PROPERLY GROUNDED, AND ISOLATED FROM OTHER COMPONENTS SUCH AS SWITCH GEAR, TRANSFORMERS, LIGHTNING ARRESTORS, ETC. BOTH ENDS OF A CABLE TO BE TESTED SHOULD BE DISCONNECTED AND PROTECTED TO SAFEGUARD PASSING PERSONNEL. THE CONDUCTORS AT THE FAR END OF A CABLE SHOULD BE SEPARATED AND TAPED TO AVOID EXTERNAL FLASH OVER OR LEAKAGE DURING THE TEST.

A MAN SHOULD BE STATIONED AT ANY POINT WHERE THE TEST ITEM IS ACCESSIBLE TO UNAUTHORIZED PEOPLE AND BARRIERS SHOULD BE ERECTED. SIGNS SHOULD BE POSTED THAT READ "DANGER - HIGH VOLTAGE TEST IN PROGRESS, KEEP AWAY." DO NOT USE TERMS SUCH AS "KILOVOLTS," "KV" OR "HV" BECAUSE THE AVERAGE PERSON DOES NOT UNDERSTAND THE TRUE MEANING OF THESE TERMS OR ABBREVIATIONS.

DECIDE UPON THE PROPER TEST PROCEDURE TO BE FOLLOWED BEFORE STARTING THE TEST.

HIGH VOLTAGE TESTING

AFTER MAKING ANY TEST TURN THE HIGH VOLTAGE SWITCH OFF AND RETURN THE VOLTAGE CONTROL TO ZERO OR MINIMUM POSITION, CHECK THE KILOVOLTMETER FOR A ZERO INDICATION (ON DC TEST THE CAPACITIVE ELEMENT OF THE TEST ITEM WILL HOLD A CHARGE AND MAY TAKE A LONG TIME TO DISCHARGE) AND *GROUND THE TEST ITEM BEFORE DISCONNECTION. AFTER A DC TEST HAS BEEN PERFORMED THE GROUND SHOULD BE LEFT ON THE ITEM FOR AT LEAST AS LONG AS THE TOTAL TIME HIGH VOLTAGE WAS APPLIED TO PREVENT A VOLTAGE BUILD UP DUE TO ABSORPTION CURRENTS. IT IS BEST TO LEAVE A GROUND ON A TEST ITEM ANY TIME IT IS NOT IN SERVICE OR UNDERGOING A TEST.

*ANY TIME A GROUND IS TO BE PLACED ON A CIRCUIT IT SHOULD FIRST BE GROUNDED WITH A HOT STICK AND RUBBER GLOVES. ALL CIRCUITS NOT IN USE (OR CONNECTED TO A GUARD OR BYPASS CIRCUIT) SHOULD BE GROUNDED.

FAULT FINDING

MAKE AN INSULATION RESISTANCE TEST ON THE FAULTED CABLE BETWEEN THE CONDUCTOR AND GROUND, SHIELD OR HOUSING BEFORE TESTING ON BOTH ENDS OF A CABLE TO DETERMINE THE CONDITION OF THE FAULT. CONSIDER ALL THE FACTORS EFFECTING THE FAULTED CABLE, SUCH AS THE RESISTANCE OF THE FAULT, THE AGE OF THE CABLE, THE CONDITION OF THE GROUND (IF BURIED), THE HUMIDITY, THE VOLTAGE RATING OF THE CABLE, ETC. AND DECIDE ON THE BEST TEST METHOD OR METHODS TO BE USED.

BECAUSE OF THE HEAVY PULSE CURRENT (POSSIBLY THOUSANDS OF AMPERES) GENERATED WITH CAPACITANCE DISCHARGE EQUIPMENT, IT IS ABSOLUTELY ESSENTIAL THAT CAREFUL ATTENTION BE PAID TO PROPER GROUNDING AND SAFETY PRACTICES. THE TEST EQUIPMENT SHOULD BE TIED TO A GOOD EARTH GROUND WITH AS SHORT AND HEAVY A CONNECTION AS POSSIBLE. THE UNUSED PHASES OF A MULTI-PHASE CABLE AND THE SHEATH OR NEUTRAL SHOULD ALSO BE TIED TO THIS SAME GROUND.

EQUIPMENT GROUNDING INSTRUCTIONS

IT IS ABSOLUTELY ESSENTIAL FOR SAFETY OF OPERATING PERSONNEL AS WELL AS FOR PROPER OPERATION OF THE TEST EQUIPMENT, THAT THE EQUIPMENT BE EFFECTIVELY GROUNDED. EFFECTIVELY GROUNDED, AS DEFINED IN THE NATIONAL ELECTRICAL CODE, MEANS "..... CONNECTED TO EARTH THROUGH A GROUND CONNECTION OF SUFFICIENTLY LOW IMPEDANCE AND HAVING SUFFICIENT AMPACITY TO PREVENT THE BUILDING UP OF VOLTAGE WHICH MAY RESULT IN UNDUE HAZARD TO CONNECTED EQUIPMENT OR TO PERSONS."

DEPENDING ON THE POWER INPUT REQUIREMENTS, SOME INSTRUMENTS MAY BE EQUIPPED WITH A POWER INPUT CABLE HAVING A THREE-PRONG GROUNDING TYPE PLUG, A TWO-PRONG PLUG WITH GROUNDING CLIP, OR A THREE CONDUCTOR CABLE TERMINATING IN LUGS (WHERE ONE LUG IS FOR GROUND CONNECTION). IN ANY CASE AN EFFECTIVE GROUND CONNECTION MUST BE PROVIDED.

WHERE A THREE-PRONG GROUNDING TYPE PLUG IS USED, THE EQUIPMENT WILL BE GROUNDED THROUGH THE GROUND PRONG PROVIDED THAT THE RECEPTACLE ITSELF IS EFFECTIVELY GROUNDED THROUGH A LOW IMPEDANCE GROUND CONNECTION.

ON INSTRUMENTS EQUIPPED WITH A TWO-PRONG PLUG AND GROUNDING CLIP, A THREE CONDUCTOR LINE CORD TERMINATED IN LUGS, OR WHERE A TWO-PRONG ADAPTER IS USED ON A THREE-PRONG PLUG, THE GROUNDING CLIP OR LEAD MUST BE CONNECTED TO A LOW IMPEDANCE EARTH GROUND. FOR A LOW IMPEDANCE EARTH GROUND, A CONTINUOUS METALLIC UNDERGROUND WATER SYSTEM MAY BE USED FOR GROUND CONNECTION. WHERE THIS IS NOT AVAILABLE A DRIVEN GROUND ROD MAY BE USED TO PROVIDE AN EFFECTIVE EARTH GROUND. IN EITHER CASE THE RESISTANCE TO GROUND OF THE PIPING SYSTEM OR DRIVEN GROUND ROD SHOULD NOT EXCEED 25 OHMS AS REQUIRED BY THE NATIONAL ELECTRICAL CODE.

SOME INSTRUMENTS ARE EQUIPPED WITH A SAFETY GROUND TERMINAL IN ADDITION TO THE GROUNDING CONDUCTOR IN THE LINE CORD. THIS TERMINAL SHOULD BE CONNECTED TO AN AUXILIARY GROUNDING ELECTRODE, HAVING LOW IMPEDANCE, SUCH AS A PIPING SYSTEM OR DRIVEN GROUND REFERRED TO ABOVE. THIS TERMINAL SHOULD BE CONNECTED TO GROUND WITH HEAVY WIRE.

IF TEST EQUIPMENT IS BEING USED IN THE FIELD WHERE INPUT POWER IS PROVIDED BY A GASOLINE ENGINE DRIVEN ALTERNATOR, GENERATOR, OR A BATTERY OPERATED CONVERTER, IT IS ESSENTIAL THAT NOT ONLY THE TEST EQUIPMENT BUT ALSO THE METALLIC FRAMEWORK OR HOUSING OF THE POWER SOURCE BE GROUNDED.

FAILURE TO COMPLY WITH THE ABOVE EQUIPMENT GROUNDING INSTRUCTIONS COULD RESULT IN DANGEROUS ELECTRICAL SHOCK TO OPERATING PERSONNEL.

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12/8/76
5209 - 101
421-9

ASSOCIATED RESEARCH, INC.

MODEL SPECIFICATION - DC HYPOT

MODEL NUMBER:	5209
DESCRIPTION:	DC Hypot - Portable
PRIMARY APPLICATION:	Dielectric withstand testing of rotating machinery, transformers, switchgear and cables for acceptance and routine maintenance in the field.
INPUT	
Voltage:	Battery operated, complete with charger.
OUTPUT	
Voltage:	0-1.5 KV DC continuously adjustable
KVA:	.010
Frequency:	DC
Current:	5 milliamperes, operating 20 MA short circuit.
Duty Cycle:	Continuous
Failure Detector:	Current sensitive overload relay with fixed sensitivity of 5 MA. Override system to bypass overload relay when microammeter switch is in 50,000 microamperes position.
VOLTAGE CONTROL:	Manually operated with zero return interlock system to avert misapplication of high voltage.
METERING	
Kilovoltmeter:	Analog -- 0-1.5 KV equipped with fixed high limit to shut off high voltage should 1.5KV be exceeded.
Microammeter:	Analog -- 0-50/500/5000/50,000 microamperes
TERMINATION	
Input:	Five foot, 3 conductor power cable terminated in 3 prong grounding type plug.
H.V.:	Receptacle with disconnectable 15 ft. cable terminated in insulated clip.
Return:	Ground terminal with disconnectable 15 ft. cables terminated in insulated clips.
CABINETRY:	Portable style, 13½" x 14" x 8"
WEIGHT:	27 lbs.

GENERAL FEATURES

"CHARGE - ON - OFF" SWITCH

The "CHARGE - ON - OFF" SWITCH is a three position toggle switch which provides for making or breaking power to both the Recharger and High Voltage circuitry. When in the charge position the Recharge circuit (line operated) is activated and the internal 12 Volt Battery is able to be recharged at a rate of .25 Amps/hour.

When the switch is in the ON position, the high voltage circuitry is then connected to the internal battery supply.

NOTE: The H.V. Circuit is powered by a 12V 4.5 Amp Hour rechargeable battery and can not be operated when in the charge position.

"MICROAMPERE" RANGE SWITCH

A four position range switch has been provided to allow full scale range selection of the Microampmeter. The ranges are calibrated for 50uA, 500uA, 5,000uA, and 50,000uA.

KILOVOLTMETER

The kilovoltmeter is connected directly across the output terminals of the instruments and provides single range visual indication of the voltage applied across the test specimen.

MICROAMPMETER

The microampmeter provides for visual monitoring of the leakage current seen by the item under test.

VOLTAGE CONTROL

Permits continuous adjustment of the output Voltage to the de-

sired value from zero to 1.5KV.

NOTE: This instrument is equipped with a zero return interlock and the Voltage control must be returned fully counter-clockwise to reset the interlock circuitry.

INPUT CABLE

A three conductor line cord terminated in a three prong grounding type plug provides for connecting 110V AC to the recharger circuit.

HIGH VOLTAGE CABLE

A single conductor High Voltage cable terminated in a male connector and insulated clip is supplied for connecting the instrument to the item under test.

RETURN AND SAFETY GROUND CABLES

Two single conductor cables each terminated in a spade lug and clip is supplied for connecting the test item to the instrument and to ground the metal case to an earth type ground.

NOTE: To prevent possible shock hazard always ground instrument via the safety ground terminal to an earth ground system.

HIGH VOLTAGE INDICATOR

A Red Long Life LED indicator provides visual indication when the H.V. circuit is energized.

POWER INDICATOR

An LED indicator provides for visual indication that the inter-

nal Battery supply has been connected via the power switch to the Electronic circuitry within the instrument.

LOW BATTERY INDICATOR

The Low Battery Indicator is designed to provide visual warning that the Battery supply requires recharging. To prevent damage to the battery and to maintain minimum power requirements for testing a back-up circuit has been installed to automatically shut down the Electronic Circuitry; should the instrument be continually used after the Low Battery light is indicated.

FUSE

A 2.5 Amp fuse has been installed to provide primary protection should an overload condition occur in the AC circuitry.

HIGH VOLTAGE OUTPUT RECEPTACLE

A female connector to receive the High Voltage Cable connector has been installed for easy access to the H.V. supply.

HIGH VOLTAGE POWER SUPPLY

The High Voltage Power Supply uses a full wave Silicon Bridge Rectifier for long life. The H.V. supply is designed for current limiting against short circuit conditions.

OVERLOAD BREAKER (INTERNAL)

A 5 milliamp electronic overload breaker provides for automatic shut off of the H.V. circuit should an overload condition be present. This circuit is always in service when the microamp range switch is in either the

50 or 500 microamp range. Should the microamp range switch be switched to the 50 milliamp position the electronic overload breaker is disconnected allowing for higher test currents to be applied.

HIGH VOLTAGE LIMITING CIRCUIT (INTERNAL)

For operator safety an electronic H.V. Limiting circuit has been installed. Should the operator attempt to exceed 1.8KV output, the H.V. circuitry will be de-activated and the Voltage control must be returned to zero to re-activate High Voltage.

BATTERY RECHARGING

1. With "charge/H.V." switch in off position, connect line cord to 110V 60Hz AC outlet.
2. Turn "charge/H.V." switch to charge position.
3. Depending on level of charge remaining within the battery, the 12V 4.5 Amp Hour battery will charge at a rate up to .25 Amp Hours. To charge a completely drained battery, 18 hours is required.
   NOTE: This instrument is designed so that the H.V. Circuitry cannot be activated while charging.

HIGH VOLTAGE TESTING

1. Connect Safety Ground Cable to Earth Ground and Safety Ground terminal.
2. Connect Return cable from Safety Ground terminal to return side of item to be tested.
3. Plug H.V. cable (male connector) into H.V. connector.
4. Connect via clip, the H.V. cable to item being tested.
5. Switch "Microamp" Switch to 5000uA range.
6. Rotate "Voltage Control" fully counter-clockwise.
7. Activate "charge/H.V." switch to H.V. ON position.
8. Slowly rotate "Voltage Control" clockwise to attain proper test voltage.
9. If desired, increase or decrease the current meter sensitivity by rotating the range switch.
   Should the item under test exceed 5 milliamps of current the overload breaker will de-activate and lock out the H.V. supply. To bypass the external overload breaker switch should be turned to 50mA position.
   NOTE: This instrument is equipped with a fast responding maximum H.V. limiting circuit. Always increase Voltage Control slowly to prevent applying over voltage to any item under test. Should either the H.V. limit circuit or overload breaker de-activate H.V., rotate the Voltage Control counter-clockwise to re-activate H.V.
10. After test is complete rotate Voltage Control fully counter-clockwise and de-activate H.V. circuit by returning "charge/H.V." switch to H.V. OFF position.

To conserve and prolong battery life always recharge battery after extended usage.

MODEL 5209

REPLACEMENT PARTS LIST

PCB	C 1-7	32611	Cap .1 uf Ceramic
	C 9	32182	Cap .0015 uf Mylar
	C 8	15217	Cap .001 uf
	C 11	32656	Elec. Cap 2000 uf 16v
	D 6,7,8,9 10,11,15,16	14503	Diode
	D 12	21088	Diode Zener 5v
	IC 1,2	32984	1 C Optoisolator 4N28
	IC 4,5	33001	1 C Quad Comp MC3302P
	IC 6,8	32399	1 C Dual Flip-Flop MC14013CP
	IC 7	32292	1 C Quad Nor MC14001CP
	IC 3	32240	1 C Regulator 8V MC7808CP
	R 1,2	11825	Res. 10K ½W 1%
	R 3,4,5,6,20, 26,30,41,47	58334	Res. 10K ½W 10%
	R 12,50	15313	Res. 100 ohm ½W 10%
	R 8	10727	Res. 330K ohm ½W 10%
	R 15,16	10948	Res. 3.5K ½W 1%
	R 11	17000	Res. 100 ohm 1W 10%
	R 25,42,52,29, 49,43,24	58333	Res. 4.7K ohm ½W 10%
	P 3,4,5	32615	Var Res 10K ohm
	P 6,7	32617	Var Res 100K ohm
	R 59	58630	Res. 1K ohm 10%
	Q 1,2	32983	Trans. 2N6055
	Q 6,8,9	32247	Trans. MPS 6530
	Q 5,7	21084	Trans. 2N5320
	Q 4	32246	Transistor 2N4921
	C 12	18302	25 uf Cap
	*	32620	14 Pin Socket
	PCB	32985	PCB
	CN 1	33104	Connector PCB
	RT 11	18972	Rectifier, Bridge
PANEL	S 4	16583	Switch Rotary
	S 1	15497	Switch Toggle
		14215	Terminal Strip
	I 2,3	33035	LED RED
	I 1	33036	LED GN
	R 27	17933	POT 25K
	R 60	10853	Res. 5K ½W 1%
	M 1-2	32885	Meter 0-50 uA
		16441	Knob
		17406	Knob, Control
		15189	Holder, Fuse
	F-1	17758	Fuse
	CN 1	10616	Con H.V. Fem
		17477	Standoff (2 Req.)
	CA 1	11649	Cable Input 115V
		30740	Strain Relief
	RT 12	14503	Rectifier
	R 63	15313	Resistor, 100 ohm, 1/2 W

VOLTAGE SHUNT BD.		19041	PCB
	R 9	10826	Resistor, 800 K
	R 23	10947	Res. 20K
	R 26	17614	Res. POT 50K
CURRENT SHUNT BD.		19041	PCB
	R 13	11825	Res. 10K
	R 7	14305	Res. 200K 1%
	R 10	17321	Res. 150 ohm
	R 45	17719	Res. POT 100 ohm
	R 19	16210	15K POT
	R 18	17723	Res. POT 2.5K
AMPLIVOLT FULL WAVE DOUBLER		33102	Bracket
	R 22	10126	Res. 1.5M ohm
	C 1-4	17447	Cap Paper .1uf 600V
	D 1-2	19400	Rectifier
		16433	Resistor 50K ohm
CABINET		16180	Cabinet
	T 1	32981	Transf. H.V.
	T 2	18294	Transf. Power 117v
		32982	Heat Sink
	Q 3	32245	Trans. 2N3055
		57115	Term Strip
		10304	Ground Term
		32979	Battery 12v-4.5 A/HR
		33182	Bracket, Battery
		19916	Resistor 27 ohm
		32495	Insulator (2 Req.)
	L	52027	Capacitor, 25 uf
	IC 9	32240	MC7808ce Regulator
	R 60	15294	Resistor, 500 ohms
	R 61	17722	Resistor, Pot. 1 K ohm
	RT 10	14503	Rectifier
	R 62	33867	Resistor, 50 ohms, 8 W

HV Cable 17337

Associated Research, Inc.

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PHONE: (312) 647-7850
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CABLE: ASOCRESCH

INSTRUMENTS FOR MEASURING:

Insulation resistance...the MEG-CHEK®
Ground resistance—soil resistivity...
the VIBROGROUND®
High Voltage breakdown, AC-DC...
the HYPOT®
Cable Fault location...
the HYJOULE®
Special instrumentation for laboratory, production, and maintenance needs.

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